

29-OCT-09
10:10:39

GEORGIA DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM
REVISED: JUNE 30, 2008
36' CURB-CURB; 5 BEAMS; 140' SPAN; 20' TALL; BRIDGE 16 ; PIER 3,5,6

PROB. NO. 0001

DESIGN DATA												DESIGN DATA														
DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C S	FC PSI	N	FY PSI	FS PSI	DESIGN EC	ES	CONC. STRAIN	Z	* MAIN SIZE	* STR TOP	* CAP MAX	REINFORCING MAX	STEEL MIN	* TOP	* MIN	* CAP MIN	REINFORCING MIN	STEEL TOP	* INCR.	* CAP BOT
D	D	D	L	2	1	12	0-00-00	3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	16	16	11	2	2.00	4.00	3.00	2.00
COLUMN MIN.P	REINFORCING MAX.P	STEEL CL.SP.	STEEL CLEAR	R MODE	KL	OC	OF	CM	BD1	BD2	IMPACT %	SOIL KCF	WT	ALL.S.P. KSF	MIN PL	MAX SP	EDGE DIST	PILE DEPTH	REBAR CLEAR	ALL.PILE CAPACITY	PILE UPLIFT	ALL.PILE INCR.	PILE I P			
1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	18.87	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000	-9.999						

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	19.625	4.000	4.000	6.000	6.000	4.000	15.625	16.000	8.000	4.000					
12	2	SAME AS CANTILEVER 1														

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND	NB	SZ	ND	NB	SZ	ND	NB	SZ	SLOPE	EP	AP			
21	1	C	T		20.000	0.000	8.000	6.000	8.000	6.000	6.000	0.000	8	6	11	8	6	11	22	16	11	22	16	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.	
31	P	10.000	10.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000	
GROUP II WIND INTENSITIES																
WIND TRANS.	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	WIND ON PIER APT	ARM APL	WIND ON PIER PT			
1365.	2730.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	2.867	10.905

GROUP III WIND

STD. WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	STD. WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	LENGTHS OF TRANS.	LL LONGI.	WIND ON PIER APT	LL ARMS APL
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	140.0	280.0	15.583	15.583

MISCELLANEOUS FORCES

CENTRI. FT	TRACTION FL	FORCE APT	AND ARMS APL	EXPANSION COEFFICIENT	SHRINKAGE COEFFICIENT	STREAM PT	FLOW PL
3.791	9.860	15.583	15.583	0.00018000	0.00044000	0.000	0.000

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	281.621	325.334	0.000	325.334	0.000	325.334	281.621					
LL 1	1	85.882	51.529	0.000	0.000	0.000	0.000	0.000					
LL 2	2	85.882	103.059	0.000	85.882	0.000	0.000	0.000					
LL 3	3	85.882	103.059	0.000	120.235	0.000	85.882	17.176					
LL 4	1	0.000	0.000	0.000	0.000	0.000	51.529	85.882					
LL 5	2	0.000	0.000	0.000	85.882	0.000	103.059	85.882					
LL 6	3	17.176	85.882	0.000	120.235	0.000	103.059	85.882					
LL 7	1	0.000	25.764	0.000	85.882	0.000	25.764	0.000					
LL 8	2	42.941	111.647	0.000	94.470	0.000	25.764	0.000					
LL 9	3	42.941	111.647	0.000	103.059	0.000	111.647	42.941					
LL10	2	0.000	85.882	0.000	103.059	0.000	85.882	0.000					
LL11	2	85.882	51.529	0.000	0.000	0.000	51.529	85.882					
LL12	3	85.882	103.059	0.000	85.882	0.000	51.529	85.882					

COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE

*

LONGITUDINAL

LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF
UNIT F.AT CL.CAP	1	0.000	-6.000	1.000	20.000	0.000	0.000	0.000	6.000	1.000	20.000	20.000
DEAD LOAD TOTAL	1	1765.594 1866.394	0.000	0.000	0.000	1866.394	8089.646	-8089.646	0.000	0.000	0.000	0.000
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-212.808	-9.860	-350.848	-350.848
CENT. FORCE 1 LN	1	0.000	-81.821	3.791	134.895	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WIND ON SUBSTR.	1	0.000	-17.202	2.867	57.340	0.000	0.000	0.000	-65.430	-10.905	-218.100	-218.100
GROUP 2 WIND 1 1	1	0.000	-930.046	71.117	1925.684	0.000	0.000	0.000	-65.430	-10.905	-218.100	-218.100
GROUP 2 WIND 1 2	1	0.000	-930.046	71.117	1925.684	0.000	0.000	0.000	65.430	10.905	218.100	218.100
GROUP 2 WIND 2 1	1	0.000	-820.505	62.927	1701.483	0.000	0.000	0.000	-284.513	-27.285	-666.503	-666.503

PIER-36-5-140-20.OUT																
GROUP	WIND	2	2	1	0.000	-820.505	62.927	1701.483	0.000	0.000	0.000	284.513	27.285	666.503	666.503	
GROUP 2	WIND	3	1	1	0.000	-765.734	58.832	1589.382	0.000	0.000	0.000	-503.595	-43.665	-1114.905	-1114.905	
GROUP 2	WIND	3	2	1	0.000	-765.734	58.832	1589.382	0.000	0.000	0.000	503.595	43.665	1114.905	1114.905	
GROUP 2	WIND	4	1	1	0.000	-619.679	47.912	1290.447	0.000	0.000	0.000	-649.650	-54.585	-1413.840	-1413.840	
GROUP 2	WIND	4	2	1	0.000	-619.679	47.912	1290.447	0.000	0.000	0.000	649.650	54.585	1413.840	1413.840	
GROUP 2	WIND	5	1	1	0.000	-327.569	26.072	692.577	0.000	0.000	0.000	-759.191	-62.775	-1638.041	-1638.041	
GROUP 2	WIND	5	2	1	0.000	-327.569	26.072	692.577	0.000	0.000	0.000	759.191	62.775	1638.041	1638.041	
GROUP 3	WIND	1	1	1	0.000	-581.176	35.335	1075.867	0.000	0.000	0.000	-19.629	-3.272	-65.430	-65.430	
GROUP 3	WIND	1	2	1	0.000	-581.176	35.335	1075.867	0.000	0.000	0.000	19.629	3.272	65.430	65.430	
GROUP 3	WIND	2	1	1	0.000	-512.054	31.198	948.827	0.000	0.000	0.000	-157.873	-11.545	-319.510	-319.510	
GROUP 3	WIND	2	2	1	0.000	-512.054	31.198	948.827	0.000	0.000	0.000	157.873	11.545	319.510	319.510	
GROUP 3	WIND	3	1	1	0.000	-477.493	29.130	885.307	0.000	0.000	0.000	-296.116	-19.819	-573.589	-573.589	
GROUP 3	WIND	3	2	1	0.000	-477.493	29.130	885.307	0.000	0.000	0.000	296.116	19.819	573.589	573.589	
GROUP 3	WIND	4	1	1	0.000	-385.331	23.614	715.921	0.000	0.000	0.000	-388.279	-25.336	-742.976	-742.976	
GROUP 3	WIND	4	2	1	0.000	-385.331	23.614	715.921	0.000	0.000	0.000	388.279	25.336	742.976	742.976	
GROUP 3	WIND	5	1	1	0.000	-201.006	12.582	377.148	0.000	0.000	0.000	-457.400	-29.472	-870.015	-870.015	
GROUP 3	WIND	5	2	1	0.000	-201.006	12.582	377.148	0.000	0.000	0.000	457.400	29.472	870.015	870.015	
LIVE LOAD	LL	1	1	1	137.411	-1786.344	0.000	1786.344	137.411	1786.344	0.000	0.000	0.000	0.000	0.000	0.000

□ COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE													* LONGITUDINAL		
LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF			
LIVE LOAD	LL	2	1	274.823	-2198.584	0.000	2198.584	274.823	2198.584	0.000	0.000	0.000			
LIVE LOAD	LL	3	1	371.011	-1113.041	0.000	1113.041	371.011	1978.726	-865.685	0.000	0.000			
LIVE LOAD	LL	4	1	137.411	1786.344	0.000	-1786.344	137.411	0.000	-1786.344	0.000	0.000			
LIVE LOAD	LL	5	1	274.823	2198.584	0.000	-2198.584	274.823	0.000	-2198.584	0.000	0.000			
LIVE LOAD	LL	6	1	371.011	1113.041	0.000	-1113.041	371.011	865.685	-1978.726	0.000	0.000			
LIVE LOAD	LL	7	1	137.410	0.000	0.000	0.000	137.410	206.112	-206.112	0.000	0.000			
LIVE LOAD	LL	8	1	274.822	-1374.120	0.000	1374.120	274.822	1580.232	-206.112	0.000	0.000			
LIVE LOAD	LL	9	1	371.011	0.000	0.000	0.000	371.011	1422.209	-1422.209	0.000	0.000			
LIVE LOAD	LL	10	1	274.823	0.000	0.000	0.000	274.823	687.056	-687.056	0.000	0.000			
LIVE LOAD	LL	11	1	274.822	0.000	0.000	0.000	274.822	1786.344	-1786.344	0.000	0.000			
LIVE LOAD	LL	12	1	371.011	-371.016	0.000	371.016	371.011	1978.726	-1607.710	0.000	0.000			

□ CAP ANALYSIS AND DESIGN DATA

CAP MOMENTS AND SHEARS													
MOMENTS(KIP-FEET)								** SHEARS(KIPS)					
POINT	D.L.TOT.	G1 MAX.+	G1 MAX.-	G2 MAX.+	G2 MAX.-	G3 MAX.+	G3 MAX.-	DL T.LT	DL T.RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT
P 1	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-18.933	-385.040	-18.933	-385.040	-18.933	-571.490
P 2	-3323.512	-3323.512	-4815.111	-3323.512	-3323.512	-3323.512	-4216.685	-440.751	-863.685	-440.751	-863.685	-627.201	-1273.876
P 3	-6846.743	-6846.743	-9979.105	-6846.743	-6846.743	-6846.743	-8722.409	-898.729	-898.729	-898.729	-898.729	-1308.920	-1308.920
C 1L	-10516.539	-10516.539	-15289.665	-10516.539	-10516.539	-10516.539	-13374.699	-936.169		-936.169		-1346.360	
C 1R	-10516.539	-10516.539	-15289.665	-10516.539	-10516.539	-10516.539	-13374.699		936.169		1346.360		936.169
P 5	-6846.743	-6846.743	-9979.104	-6846.743	-6846.743	-6846.743	-8722.409	898.729	898.729	1308.920	1308.920	898.729	898.729
P 6	-3323.512	-3323.512	-4815.110	-3323.512	-3323.512	-3323.512	-4216.685	863.685	440.751	1273.876	627.201	863.685	440.751
P 7	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	385.040	18.933	571.490	18.933	385.040	18.933

CAP DESIGN DATA																	
PT.	UNF. K-FT.		TOP REINFORCE. AS NO. SIZE.		BOT. REINFORCE. AS NO. SIZE.		LEFT STIRRUPS M.SP. AV/IN BAR&SPAC			RIGHT STIRRUPS M.SP. AV/IN BAR&SPAC			D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
	M+	M-	AS	NO. SIZE.	AS	NO. SIZE.	M.SP.	AV/IN	BAR&SPAC	M.SP.	AV/IN	BAR&SPAC					
P 1	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	0.00	0.000	#5@ 0.00	24.00	0.060	#5@10.33	59.14		0.08	0.000	0.099
P 2	-2556.548	-3243.604	13.63	9 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.169D#5@ 7.35	83.71		0.25	0.563	1.210	
P 3	-5266.726	-6709.546	24.80	16 # 11	3.12	2 # 11	24.00	0.135	#5@ 4.59	24.00	0.135	#5@ 4.59	96.00		0.41	0.593	1.040
C 1	-8089.646	-10288.230	38.97	25 # 11	3.12	2 # 11	24.00	0.145	#5@ 4.29	24.00	0.145	#5@ 4.29	96.00		0.63	0.593	0.977
P 5	-5266.726	-6709.545	24.80	16 # 11	3.12	2 # 11	24.00	0.135	#5@ 4.59	24.00	0.135	#5@ 4.59	96.00		0.41	0.593	1.040
P 6	-2556.548	-3243.604	13.63	9 # 11	3.12	2 # 11	24.00	0.169D#5@ 7.35	24.00	0.060	#5@10.33	83.71		0.25	0.563	1.210	
P 7	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	59.14		0.08	0.000	0.099

NOTE: *** FS/FZ RATIO EXCEEDS 1.0! ***

PIER-36-5-140-20.OUT

CRITICAL COLUMN LOADS

CN	T	B	GR	LLC	WC	R	E	C	S	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T	1	LL	2	0.0			C		2891.9	-4985.9	0.0	2891.9	4985.9	1807.2	9077.6	15657.0	5675.2	3.140	72.00	96.00
1	B	1	LL	2	0.0			C		3023.0	5123.9	0.0	3023.0	5123.9	1889.1	9153.7	15522.1	5722.9	3.029	72.00	96.00

COLUMN DESIGN DATA

CN	T	B	FACE 1	B	FACE 2	D	FACE 3	D	FACE 4	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC
1	T	15	# 11	15	# 11	8	# 11	8	# 11	71.76	1.038	1.00	0.000	2957.	123028.	1.000	1.042	1.000	2	0.70
1	B	15	# 11	15	# 11	8	# 11	8	# 11	71.76	1.038	1.00	0.000	2957.	123028.	1.000	1.042	1.000	2	0.70

FOOTING 1 DESIGN LOADS

F	G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
1	1	LL	2	0.0		C	2097.590	2119.360	7.582	0.000	0.000	145.200	145.200	234.850	234.850	124.621	-0.264	45.025	MAX.P1
1	1	LL	2	0.0		C	2928.239	4366.144	9.857	0.000	0.000	171.979	171.979	355.648	355.648	189.783	-0.343	62.741	MAX.MT
1	3	LL	2	1.1		C	2726.867	4153.795	55.792	-997.265	-29.889	183.662	127.448	310.402	366.617	180.327	-0.343	58.532	MAX.VT
1	1	LL	2	0.0		C	2928.239	4366.144	9.857	0.000	0.000	171.979	171.979	355.648	355.648	189.783	-0.343	62.741	MAX.VP
1	3	LL	3	4.1		C	2832.061	2621.436	44.004	-2197.346	-67.545	259.399	135.179	252.198	376.418	186.316	33.381	60.731	MAX.ML
1	3	LL	3	4.1		C	2832.061	2621.436	44.004	-2197.346	-67.545	259.399	135.179	252.198	376.418	186.316	33.381	60.731	MAX.VL
1	3	LL	2	4.1		C	2097.590	2835.281	31.196	-1444.672	-45.056	169.098	87.290	210.951	292.759	134.004	-0.264	45.025	MAX.P3

FOOTING 1 ANALYSIS/DESIGN RESULTS

FOOTING SIZE				* BAR REINFORCEMENT STEEL *					SECTION CAPACITIES *			
B	D	T	P1/PA	AS	NO.SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC
14.500	14.500	4.250	0.999	1.24	19 # 9	@ 9.125	TOP LONG	195.806	41.406	82.811	34.308	0.000
				1.23	18 # 9	@ 9.625	BOT.TRAN	192.125	42.767	85.534	35.436	0.000

NUMBER OF PILES = 12 BP = 2.000 DP = 6.000